IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Claus Breuer
Appl. No.	:	10/551,245
Filed	:	September 28, 2005
Title	:	PISTON RING
Grp./A.U.	:	3673
Examiner	:	Gilbert Y. Lee
Docket No.	:	710270-022

AMENDMENT

MAIL STOP AMENDMENT
Commissioner of Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Dear Sir:

In response to the office action dated April 17, 2007, please amend this application as follows:

IN THE SPECIFICATION

Please replace the paragraph beginning on line 10 on page 3 and ending on line 19 on page 3 with the following rewritten paragraph:

Figure 1 depicts a piston ring 1, which can be installed into the first or second groove of a piston (not represented). Piston ring 1 is depicted in top view, so that only friction surface 2, the inner surface 3, as well as the upper flank 4 are recognizable. In the piston ring gap 5 the piston ring 1 exhibits a predeterminable wall thickness. The wall thickness t of the piston ring 1 varies, based on the gap 5 in the direction of the surface diametrically opposite 6 (180°) comprising the rear of the ring. At the rear of the ring 6, a wall thickness is given, which is thicker than the opposite side by the ring gap material cross-section. Figure 1 depicts the area near the upper flank 4 with a cross-section cut 7 in the inner surface 3 in the form of a bevel. This bevel 7 begins with an equally large cross-section at the gap 5 and is reduced to the rear ring 6 equally in both directions of the surface. By means of this procedure the piston ring 1 maintains a constant twist angle, that is remaining consistent, over the surface.

LISTING OF CLAIMS:

1-7(Cancelled).

8(Currently Amended). A piston ring having a gap, a friction surface, an inner surface and upper and lower flanks, a non-constant cross-section cut which when viewed in a circumferential direction is wider in the area of the gap as compared to an area diametrically opposed from the gap;

said piston ring having a radial wall thickness that varies, where in the area of the gap the wall thickness is smaller than the area diametrically opposite from the gap, wherein the relationship between the wall thickness and the cross-section cut is continually so formed that the piston ring, viewed in the circumferential direction presents a constant twist angle (ϕ).

9(Previously Presented). The piston ring according to claim 8, wherein the constant twist angle (ϕ) is satisfied by the following formula:

$(\phi) = Mt/G*I(\phi)$

where

ϕ is the twist angle

G is the Slide module

I is the polar surface moment of inertia

Mt is the bending load.

10(Previously Presented). The piston ring according to claim 8, wherein the cross-section cut is formed by a bevel.

11(Previously Presented). The piston ring according to claim 10, wherein the bevel has an angle $\propto$ that varies in the circumferential direction.

12(Previously Presented). The piston ring according to claim 10, wherein the bevel has an angle $\propto$ that is constant in the circumferential direction.

13(Previously Presented). The piston ring according to claim 8, wherein the cut is formed by means of an angular exclusion.

IN THE DRAWINGS:

The attached sheets of drawings include changes to Figures 2-6. These sheets, which includes Figures 1-6, replaces the original sheets of drawings including Figures 1-6.

Attachment: Replacement Sheets

REMARKS

Reconsideration of this application as amended is respectfully requested.

An IDS form PTO-892 is filed herewith. Consideration of the listed art is requested.

Replacement drawings sheets 1 and 2 are filed herewith to address the objections noted by the examiner and to help clarify features described and claimed in the application. No new matter has been added.

a) Thickness label "t" has been added to Figures 2-4 to identify the varying thickness of the ring, as is also depicted in Figure 1 and described in the specification.

b) Figure 5 has been labeled "Prior Art" and twist angle ϕ has been added for clarity.

c) Figure 6 has been corrected to illustrate the proper twist angle curve of the prior art ring of Figure 5, starting from a smaller twist angle at the ring gap and transitioning to a larger twist angle toward the ring back. This curve was inadvertently reversed in the application as filed.

d) English language labels have been added to Figures 5 and 6.

The specification has been amended at page 3, line 13 consistent with the changes to Figures 2-4 to introduce thickness label "t" to the description to help provide clearer understanding of the varying thickness characterization. No new matter has been added.

The rejection of claim 8 over Kinsley in view of SU'906 is respectfully traversed. Claim 8 recites a variable wall thickness that is smaller in the area of the ring gap and larger in the area of the opposite the ring gap. Claim 8 further recites a cross-sectional cut that is wider in the area of the ring gap and smaller in the area opposite the ring gap. Claim 8 further recites that the relationship between the thickness and cross-sectional cut is such that a constant twist angle is achieved.

Amended Figure 2-4 and 5-6 illustrate an embodiment having the recited features. Figures 2-4 show the recited variable thickness t and a variable cross-sectional cut 7. Figure 6 shows the constant twist angle, labeled 1.

It is respectfully submitted that the rejection of claim 8 is improper since the examiner has not provided any evidence to support that there is any reason to combine the references in the manner suggested, and further that one of ordinary skill would expect the end result to be a piston ring which meets the limitations of claim 8.

Kinsley describes a two-piece ring having an L-shaped master ring 1 and an outer seal ring 4. Both are formed with gaps 3, 5, respectfully. The rings are configured to prevent leakage of oil through the ring groove, and particularly across the ring gap. Kinsley forms a lug 6 of the seal ring 4 that nests in the gap 3 of the master ring to lock the rings in circumferential position so the gaps 3, 5 cannot communicate with one another. There is no mention in Kinsley of any desire or need to control elastic deformation of the seal ring, or for that matter any other reason to modify the shape of the rings, and particularly to add a cross-sectional cut of variable width, as called for by claim 8. The examiner concedes that Kinsley is silent as to the claimed feature of a cross-sectional cut that is wider in the area of the gap and narrows toward the side opposite the gap. The examiner looks to SU'906 to make up for that lack of teachings or suggestion in Kinsley of providing this claimed feature. The SU'906 reference is a non-English reference. The only useable information comes from the drawings. There is no reason why one of ordinary skill, looking at RU'906, would be lead or motivated to incorporate any features of its ring into the ring of Kinsley. It is noted that the ring of RU'906 is of one piece and of constant width, and there is nothing that would lead one to conclude that the groove feature 2 could or should be combined with any other ring type. It is also uncertain what effect incorporating such a feature, even if it could be done, would have on the function and performance of two-part ring of Kinsley.

The examiner's conclusion that one of ordinary skill would be lead to incorporate the groove feature of RU'906 into the piston ring of Kinsley "in order to control elastic deformation of the seal ring" is not based on any evidence of record and is believed to be

speculative and derived from the applicants own disclosure rather than the prior art. If the examiner is to rely on this basis to sustain the rejection, it is requested that proper evidentiary support be presented for the record, or else withdraw the rejection.

The examiner further concludes that incorporating such a groove 2 of RU'906 into the piston ring of Kinsley would necessarily result in the further claimed relationship of the width and cross-section cut features being such as to yield a constant twist angle. Both Kinsley and RU'906 are silent as to any twist angle. The evidence does not support any conclusion that introducing the groove 2 of RU'906 would or should alter or impart a twist angle to the piston ring, let alone one that is constant. There is further no reason why one of ordinary skill would look to either references for any teachings as to controlling the twist angle of a piston ring, since neither reference mentions this feature. If the examiner is to rely on the stated conclusion that a constant twist angle would necessarily result from the asserted combination, applicants challenge this conclusion and request that the examiner produce appropriate evidence to support the assertion, or else withdraw the rejection.

It is believed that this application now is in condition for allowance. Further and favorable action is requested.

The Patent Office is authorized to charge or refund any fee deficiency or excess to Deposit Account No. 04-1061.

Respectfully submitted,

DICKINSON WRIGHT PLLC

July 17, 2007
Date

/Robert L. Stearns/
Robert L. Stearns, Registration No. 36,937
38525 Woodward Avenue, Suite 2000
Bloomfield Hills, Michigan 48304-2970
(248) 433-7382